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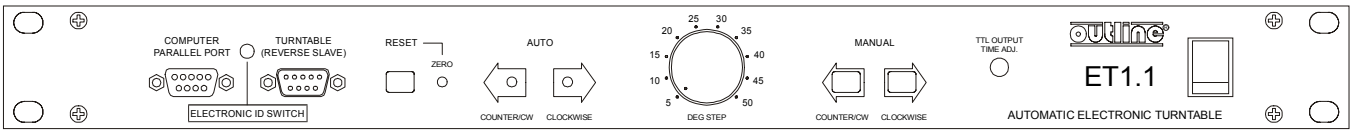
Automatic electronic unit



New features

- It is possible to control turntables directly from PC, with ET Commander software
- It is possible to drive two turntables with one ET1.1. The second turntable is slave and spin in opposite sense respect Master turntable.

Front panel

COMPUTER PARALLEL PORT: connector for link to PC parallel port with supplied cable. It is used with ET Commander software. See “Control protocol” to use a customised software.

TURNTABLE (REVERSE SLAVE): connector for second turntable, which must be always used contemporary with Master turntable (connector on rear panel). Slave turntable spin always in opposite sense respect master turntable and is passive (don't is possible control directly slave turntable without master turntable).

RESET: push-button to restore zero degrees position (measurement starting position). It can be used to avoid cables twisting as well.

ZERO: when LED is lighting the turntable is at zero degrees position (0°).

AUTO: twin LED indicator turntable rotation direction both in automatic or manual mode.

DEG STEP: angular increments control switch (min 5 deg - max 45 deg). Used only in automatic control from PC measurement cards. (COMPUTER connector on rear panel).

MANUAL: manual rotation direction control. Pushing the manual buttons the turntable will move only in a linear mode. Therefore will not step by a fixed number of degrees, so you must see the turntable and release the buttons at desired degrees rotation.

TTL OUTPUT DELAY ADJ: screwdriver adjustment for TTL pulse output delay using MLSSA measurement system only. This delay adjustment, from 3 to 25 seconds, occur between two measurement taken from MLSSA to achieve the desired time measurement condition.(i.e. you can adjust the delay to obtain rotational speed of 1 sec. 1 degree - Heyser).

Rear panel

VCC IN 12/20 V:	system power supply XLR connection from 12 to 20 Vcc with on LED indicator.
TURNTABLE:	connection link from control unit ET1.1 to main ST2 turntable (MASTER).
COMPUTER:	connector for link to measurement cards (LMS, MLSSA, CLIO, TEF).

Hardware applications

- ET Commander – the turntable is directly controlled by Personal Computer. It is supplied the link cable with DB25 connector (for PC parallel port) and DB9 ones. If you use two turntables and two ET1.1, you can order the apposite adapter to Outline.

- LMS System - the turntable is driven by TTL pulse on LMS PC CARD connector DB25 (see operating manual version 3.05 pages 1-8). Connection wiring and DB9 adapter are included with the turntable. Connection wiring are included, also from turntable ST2 to electronic control ET1.1, with 10 Mt multipolar wire.

Interconnections diagram:

LMS PC CARD ---> DB9 adapter ---> DB9 extension cable ---> ET1.1 (Computer - Measurement cards port)

TURNTABLE ---> 10 mt multipolar wire ---> ET1.1 (Turntable)

- MLSSA System - the turntable is driven by TTL pulse on MLSSA PC CARD connector DB9. Connection wiring are included with the turntable. Connection wiring are included, also from turntable ST2 to electronic control ET1.1, with 10 mt multipolar wire

Interconnections diagram:

MLSSA PC CARD -------> DB9 extension cable -------> ET1.1 (Computer - Measurement cards port)

TURNTABLE -------> 10 mt multipolar wire -------> ET1.1 (Turntable)

- CLIO System - the turntable is driven by a TTL pulse generated by the CLIO software directly on the standard parallel port. The DB9 adapter cable supplied (with a DB9 female connector) has to be soldered to a DB25 male connector. As described in CLIO's Users Manual (Section 7.4.4), the start signal (DB9 pin 2) has to be connected to pin 9 and ground (DB9 pin 4) to pin 22 (or one among pin 18 to 25).

Interconnections diagram:

CLIO PC CARD (BY MEANS OF LPT PORT) -------> DB25-DB9 adapter cable -------> DB9 extension cable -------> ET1.1 (Computer - Measurement cards port)

TURNTABLE -------> 10 mt multipolar wire -------> ET1.1 (Turntable)

- TEF System - the turntable is driven by a TTL pulse on the "External Trigger" connector. The DB9 adapter cable supplied (with a DB9 female connector) has to be soldered to a Switchcraft #60PC4F connector. As described in TEF User's Manual, the start signal (DB9 pin 2) has to be connected to pin 2, the return pulse (DB9 pin 5) to pin 4 and ground (DB9 pin 4) to pin 1.

TEF "EXTERNAL TRIGGER" -------> Switchcraft #60PC4F-DB9 adapter cable -------> DB9 extension cable -------> ET1.1 (Computer - Measurement cards port)

TURNTABLE -------> 10 mt multipolar wire -------> ET1.1 (Turntable)

Software applications

- ET Commander – is a program that allow to control by PC one or maximum two ET1.1-ST2 Outline turntables.

Main features:
- Movement in both sense rotation to desired position degrees.
- 360° automatic spin with settable degrees step
- Macro store of same positions
- Start command for 360° automatic spin and macro operations, in 4 mode:
  a) Manual: by a key pressure.
  b) Timer: automatic with timer.
  c) External: by an external TTL pulse on parallel port.

  d) Internal: the program wait a bit changing reading an internal address of parallel port (for expert programmer only).

With two turntables:
- It is possible to make 360° automatic spin for both turntables in alternate or sequential mode.

- LMS Applications - for LMS use are included four predefined macro programs to easy change type of measurement and angular increment, even if everyone will write his own macro program.

1. SPL Normal Fixed Frequency: the macro that perform this measurement is POLFIX.MAC (LMS 3.05) or POLFIX35.MAC (LMS 3.5) which use POL***.SET to define measurement parameters and POLFIX.LIB to handle and store the data.
   A special Menu allows the user to select test frequency of 18 1/3 octave spaced.
   POLFIX.MAC (POLFIX35.MAC) makes 24 measurements with different angular positions; set the selector switch (DEG STEP) to 15 degrees step.

Example:

Operation : The macro program menu is selected by pressing the (**M**) key at the main menu. The work area contains a window listing *.MAC macro files. The cursor keys are used to scroll thought the macro file listing to position the desired file in the highlight for an operation.
(**L**)oad/Execute command loads and then execute (runs) the selected macro file program. After pressing the (**L**) key, the macro program will be loaded in to memory and immediately executed. From this time on, the LMS system will be under program control until the program has finished.

2. SPL Gated Fixed Frequency: the macro that perform this measurement is POLFIXG.MAC (LMS 3.05) or POLFIG35.MAC (LMS 3.5) which use POL***G.SET to define measurement parameters and POLFIXG.LIB to handle and store the data.
   A special Menu allows the user to select test frequency of 18 1/3 octave spaced.
   POLFIXG.MAC (POLFIG35.MAC) makes 24 measurements with different angular positions; set the selector switch (DEG STEP) to 15 degree step.

3.(4) SPL Normal (Gated) Frequency Sweep: the macro that perform this measurement is POLSWEEP.MAC (LMS 3.05) or POLSWE35.MAC (LMS 3.5) which use SPLPOL.SET(Normal) and SPLPOLG.SET(Gated) to define measurement parameters.
   POLSWEEP.MAC (POLSWE35.MAC) also use POLSWEEP.LIB to handle and store the data.
   A special Menu allows the user to select Normal (sinewave) or Gated measurements.
   POLSWEEP.MAC (POLSWE35.MAC) makes 12 measurements with frequency sweep from 20Hz to 20KHz and different angular positions; set the selector switch (DEG STEP) to 30 degrees step.

Stored data will be handle according standard LMS practice.

NOTE: default frequency band is from 20Hz to 20KHz. To change permanently to a new range use the command (**F**)requency Range for Sweep in (**S**)ystem menu and (**S**)ave as SPLPOLG.SET and SPLPOL.SET by Quick Setup of LMS.

- For LMS 3.05 Users only -
To obtain the right synchronization with ST2/ET1.1 turntable you must change the LMS System Control Parameters (SCP in the main menu) mentioned below.

Measurement type	SCP15	SCP19	SCP20	SCP41
Standard	Yes	-	100	400
SPL Nor Fix	No	Beep	2000	20000
SPL Gat Fix	No	Beep	2000	20000
SPL Nor Sweep	-	-	2000	400
SPL Gat Sweep	-	-	2000	400

SCP41 in fixed frequency measurements must be >= 20000 to add 2 sec to the settling delay time between reads and enable the right turntable rotation.
SCP20 define the trigger pulse width and must be = 2000 (20 msec) to assure the compatibility of control unit ET1.1 both with LMS and MLSSA programs, without different dedicated electronics circuits.
Even if is not necessary to change the values of SCP15 and SCP19 it is recommended to speed up the measurement.

These arrangements must be executed before macro loading, however they are remarked at the macro beginning.

SCP operations are not necessary for LMS Release 3.5 Users.

NOTE: actual Osc Level is setted on -20 dBm. You can change the default value according your measurement necessity.

- MLSSA Applications - for MLSSA use are included four predefined macro programs to easy change angular increments measurement.
Of course you can edit every macro as you need

1. MLSSA POLAR5 (37 measurement cycles - 180 degrees).
2. MLSSA POLAR10 (19 measurement cycles - 180 degrees).
3. MLSSA POLAR15 (13 measurement cycles - 180 degrees).
4. MLSSA POLAR30 (12 measurement cycles - 360 degrees).

The macro POLMAIN will be helpful in starting operations, because it adjust some program setup automatically avoiding troublesome inadvertence.

Example.

(**M**)acro (**L**)oad
message: MACRO LOAD FILENAME
operation: type POLMAIN (or Right Arrow) <enter>
(**M**)acro (**E**)xecute
message: MACRO LOAD FILENAME
operation: type POLAR5 (or Right Arrow) <enter>
message: TRANSFER AUTONAME ROOT
operation: type the measurement identification filename (max 5 char) then press <enter>.
Pressing <enter> without any specification the last is valid (or ROOT for the first measurement).
---

message: Position speaker on axis (0 degree position)
operation: position speaker on axis (0 degrees) in according with turntable OUTLINE ST2 0 position (press RESET on ET1.1 if it is not or if you need to rotate counter clockwise the turntable) set angular increment control switch DEG STEP on 5 degrees and press <enter>.

From this time on, the MLSSA system will be under program control until the program has finished.

The same for POLAR10, POLAR15, POLAR30.

Before starting with measurement you must set angular increment control switch DEG STEP to the same value of macro polar measurements.

MLSSA display each measurement superimposed one upon another in frequency domain as three-dimensional plots (Waterfall Plots). "Smoothed" mode with 1/3 octave resolution allow you an easy read-out.

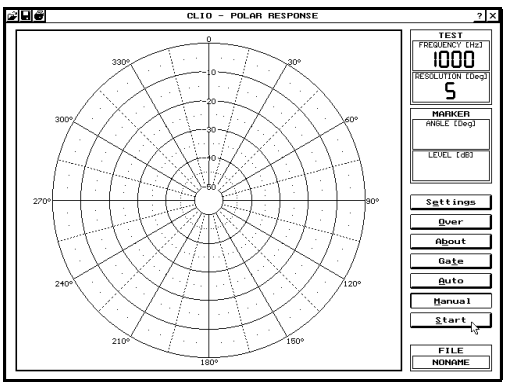
The measurements are stored in POLAR subdirectory as files defined by filename (Autoname Root) and progressive numbering.
These files can be recalled separately or one upon another by:
(**T**)ransfer (**L**)oad POLAR*<right arrow>command.

NOTE: actual Stimulus Amplitude is setted on +/- 0.1 Volt. You can change the default value according your measurement necessity. In the same way you can change of course any parameters setup.

For better details on MLSSA polar measurements see manual instructions.

NOTICE
Turntable electronic control (ET1.1) was designed for using in conjunction with MLSSA version 8.1A software and following versions. Using older MLSSA version it is possible that turntable skips a rotation degree's step failing the actual measurement.
Because MLSSA use the computer's clock to determine the duration of the TTL pulse (10 msec. see pag.59 on 8 version manual) that drive the turntable, if the computer's internal clock is flaky then the pulse width will easy vary and when the duration of the pulse is too short, less then 2 msec.
For this reason the ET1.1 control has some problem to recognise the incoming signal from MLSSA board, so the turntable skips the step corresponding to the too short pulse received.
Because it is very difficult to make the turntable's control circuit able to accept a wide range of pulse duration starting from the shortest pulse that are too much similar to noise (to which the turntable control must be insensitive), to avoid problem with some computers, DRA, consulted by OUTLINE, has already change the software using the internal clock on MLSSA board that control with accuracy the duration of TTL pulse without any computer's clock dependence.

- CLIO Applications – The CLIO standard software includes the POLAR measurement menu.



With this integrated environment it is possible to execute automatic polar plots at specified measurement frequencies, with direct turntable control. Refer to CLIO User's Manual (Section 11.6) for all the necessary information.
When the QC software version is used it is also possible to program the QC processor to control two turntables thus executing automatic measurements, over a full or half space, in order to obtain, with ulterior post processing, 3D polar plots. The two following scripts are needed and serve as a starting example for this particular test environment:

SAMPLE.STP

```
[GLOBALS]
COMPANY=MY COMPANY              ;Company Name
TITLE=POLAR MEASUREMENTS        ;Measurements Title
MANUAL=0                        ;Sets tests to automatic
KILLMESSAGE=1                   ;Kills any prompting message
CYCLIC=CYCLIC.STP               ;Name of cyclic file for second turntable movement
REPETITION=72                   ;Number of measurements in a full circle for 5 degrees res
[MLS]
MLSOUT=0                        ;Output signal level = 0 dBu
MLSREFCURVE=TEST.MLS            ;Name of file used as reference
MLSREFLIMITS=TEST.LIM           ;Name of limits file .... don't care
MLSAUTOSAVE=1                   ;Sets QC to save every measurement
MLSTXTSAVE=1                    ;Saves file as a .txt document
MLSTXTSAVEPH=1                  ;Includes phase information in the ASCII output
[SIGNAL]
LPTBIT=4                        ;Controls first turntable with LPT BIT 4
STATUS=1                        ;Sets BIT 4 to ON
DELAY=100                       ;Sets duration of TTL pulse
LPTBIT=4                        ;Controls first turntable with LPT BIT 4
STATUS=0                        ;Sets BIT 4 to OFF
```

CYCLIC.STP

```
[GLOBALS]
COMPANY=MY COMPANY              ;Company Name
TITLE=POLAR MEASUREMENTS        ;Measurements Title
MANUAL=0                        ;Sets tests to automatic
KILLMESSAGE=1                   ;Kills any prompting message
 [MLS]                          ; .... Dummy MLS measurement
MLSOUT=0                        ;Output signal level .... don't care
MLSREFCURVE=TEST.MLS            ;Name of file used as reference .... don't care
MLSREFLIMITS=TEST.LIM           ;Name of limits file .... don't care
[SIGNAL]
LPTBIT=5                        ;Controls second turntable with LPT BIT 5
STATUS=1                        ;Sets BIT 5 to ON
DELAY=100                       ;Sets duration of TTL pulse
LPTBIT=5                        ;Controls second turntable with LPT BIT 5
STATUS=0                        ;Sets BIT 5 to OFF
```

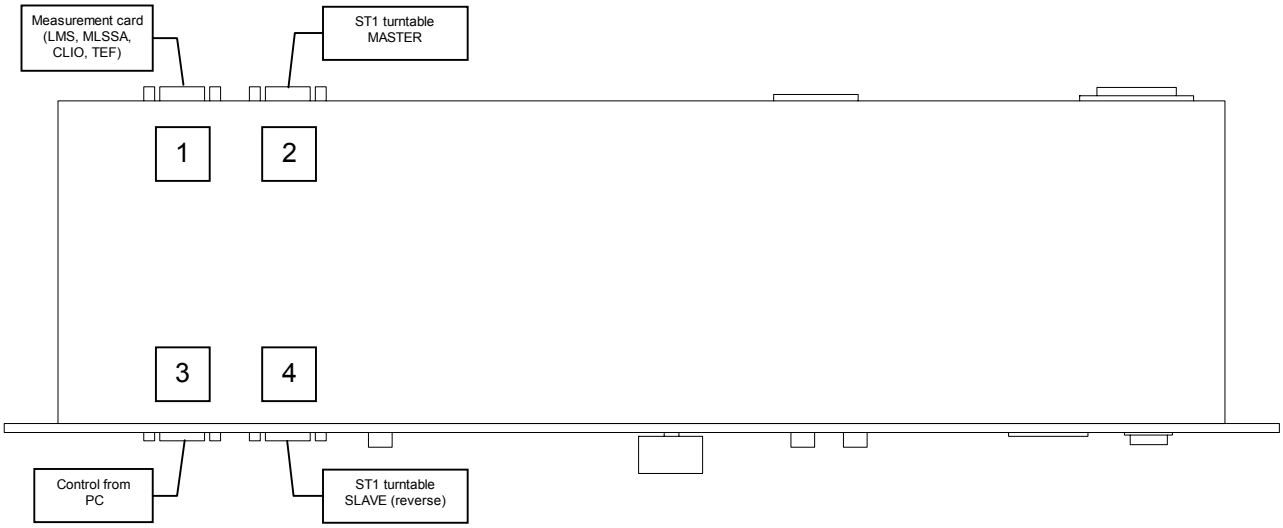
Important note

ST2 turntable has been developed to support max. 300 Kg weight loaded on the centre of gravity with not more then 30 Kg twisting moment. It can be also loaded, for example fixed under the ceiling with 100 Kg hanging under the turntable plate with the same twisting moment. Take care in handling and laterally moving very high weight on the turntable's rotating plate; it can happens to break some cogs of the internal motor reduction gear. To avoid this please keep the plate fixed during the loudspeaker loading.

Accessories

- On request is available an adjustable support stand for small loudspeakers in size useful to get the measures in the middle height of the room, far as possible from the reflections.
- It is also available on request a cable adapter to manage at the same time two electronic control ET1.1 with the ET Commader program supplied.

ET1.1 (or ET1 upgraded) connections



1) Measurement cards (LMS, MLSSA, CLIO, TEF).
   Pin 1, 3, 6, 7, 8, 9 : not connected
   Pin 2 : start pulse
   Pin 4 : ground
   Pin 5 : return pulse

2) ST2 (ST1) master turntable
   Pin 2, 7, 8 : not connected
   Pin 1 : Vss motor
   Pin 3 : + 12V
   Pin 4 : Gnd
   Pin 5 : step control
   Pin 6 : Vdd motor
   Pin 9 : zero position control

3) PC control. It is supplied a parallel adapter to use Outline ET Commander.
   See “Control protocol”

4) ST2 (ST1) slave turntable. This must always used with a ST2 master turntable.
   Pin 2, 3, 4, 5, 7, 8, 9 : non connected
   Pin 1 : Vss motor
   Pin 6 : Vdd motor

ST2 (ST1) connection

ST2 (ST1) master turntable
Pin 1 : Vdd motor
Pin 2 : Vss motor
Pin 3 : + 12V
Pin 4 : Gnd
Pin 5 : step control
Pin 6 : zero position control

Control protocol

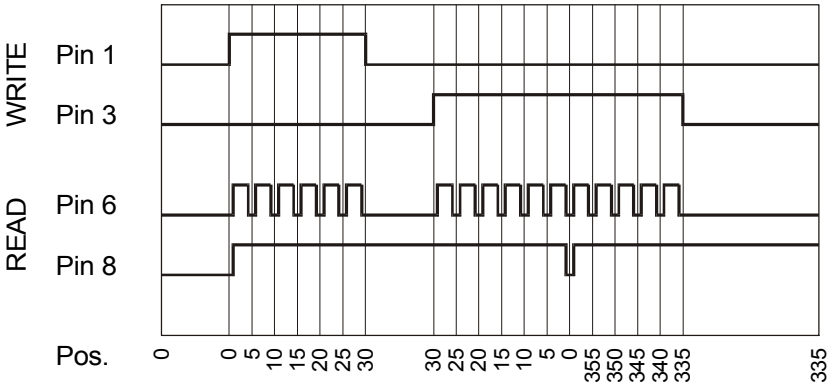
"COMPUTER PARALLEL PORT" (9 pins connector).

Pin 5: ground

Writing bits
Pin 1: unit "A" movement ahead bit
Pin 2: unit "B" movement ahead bit
Pin 3: unit "A" movement behind bit
Pin 4: unit "B" movement behind bit

Reading bits
Pin 6: unit "A" step bit
Pin 7: unit "B" step bit
Pin 8: unit "A" zero position bit
Pin 9: unit "B" zero position bit

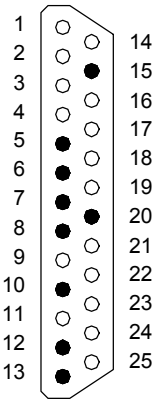
Example of unit "A" control



Connection cables

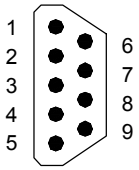
PC – ET1.1 connection

DB25 male connector
View from soldering side



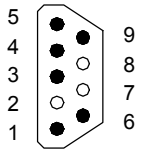
Pin 5----------Pin 1
Pin 6----------Pin 2
Pin 7----------Pin 3
Pin 8----------Pin 4
Pin 20 --------Pin 5
Pin 15 --------Pin 6
Pin 13 --------Pin 7
Pin 12 --------Pin 8
Pin 10 --------Pin 9

DB9 male connector
View from soldering side



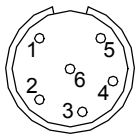
ET1.1 (ET1) – ST2 (ST1) connection

DB9 female connector
View from soldering side



Pin 6----------Pin 1
Pin 1----------Pin 2
Pin 3----------Pin 3
Pin 4----------Pin 4
Pin 5----------Pin 5
Pin 9----------Pin 6

6 poles female connector
View from soldering side



SPECIFICATIONS

Power supply:	110/220 VCA 50/60 Hz outlet with fuse and mains voltage changeover jumper. 12/20 VCC connector with fuse and protection against short circuit and polarity inversion
Max rotation speed. :	200 msec/degree
Precision :	± 0.25°
Rotation system control :	optoswitch with flying spot scanning.
Input/output connections :	9 pins sockets (DB9).
Input pulse :	TTL (from 5 to 12 VCC) imp. 680 Ohm.
Output pulse :	TTL with variable delay from 3 to 25 sec. Pulse duration 0.5 sec.
Rotation offset :	adjustable from 5° to 45° by 5° step. Push on automatic reset.
Weight capacity:	max 300 Kg stacked on. max 100 Kg suspended max 30 Kg twisting moment
Dimensions :	ET1.1 - n. 1 E.I.A. standard rack unit. ST2 - 35 cm diameter and10 cm height.